



MUNICIPAL SOLID WASTE
MATERIAL RECOVERY
NEWSPAPERS AND FERROUS

January, 1982

TD
794.5
P86
1982



Ministry
of the
Environment

The Honourable
Keith C. Norton, Q.C.,
Minister

Gérard J. M. Raymond
Deputy Minister

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact Service Ontario Publications at copyright@ontario.ca

TD
794.5
P86
1982

**MUNICIPAL SOLID WASTE
MATERIAL RECOVERY - NEWSPAPERS AND FERROUS**

PETER J. PROVIAS, P.ENG.

WASTE MANAGEMENT BRANCH

ONTARIO MINISTRY OF THE ENVIRONMENT

JANUARY, 1982

MUNICIPAL SOLID WASTE

MATERIAL RECOVERY

Summary

The recycling industry (secondary materials) is unique in that it competes on a national and world market on a free trade basis. This is true of the secondary materials like waste newspapers, corrugated paper and scrap metals.

The laws of supply and demand are very much in evidence as recovered materials are shipped across borders and oceans to satisfy demands.

Currently both the waste paper and scrap metal movements are affected by a downward trend in economic activity, not only in North America but in other parts of the world.

In the past, traders here could adjust to poor domestic markets by exporting to more active export markets in the Far East, and Europe. Currently, however, these markets are also suffering from a recession.

High interest costs, labour strikes and shortages, inflationary pressures, slack construction in housing and industry are having a negative effect on the economy. Secondary waste papers are affected because board mills, corrugating mills, roofing and felt mills, have reduced paper products output. Newsprint mills which use some waste undeinked news papers are, because of the nature of their export markets, still active although adjusting in some market areas. Any waste paper directed to the newsprint industry will have a positive effect on

price stability and demand for waste newspapers. For that reason the advent of waste newspaper deinking in Canada for making newsprint will stimulate the demand. The new facilities of Ontario Paper Co., Thorold, Ontario, which is building the first deinking newsprint mill in Canada, are still several months away so no stabilization of the waste paper market, can be expected until the latter half of 1982. Depending on the success of the new Thorold Plant, it is conceivable that a second newspaper deinking mill could be built in Ontario, although there has been no indication from the industry to that effect.

The current price for waste newspapers is now in the \$5 to \$15 range per ton with no improvement in sight until at least the second quarter of 1982 at the earliest. Prices then should adjust to the \$60 to \$80 per ton range at the mill when the deinking operation at Thorold starts to put some demand on the market place.

Waste news had reached \$65 per ton average earlier in the year. Previous years have seen prices of over \$100 per ton, in late 1977, and early 1978, and as low as \$5 per ton in 1975 with cycles in between.

The demand for scrap ferrous metals also depends on the state of the economy within North America as well as the export markets. Steel production, including foundries, the bellwether of the scrap economy, dictates the movement and price of steel scrap.

Currently, steel production in Canada, although not severely down has been suffering from the recently settled lengthy strike at Stelco.

What effect this will have on the scrap market when Stelco again enters the market as a buyer is not known. Although scrap prices have not dropped drastically, the material is not moving from seller to buyer, and dealers are being forced to retrench, maintain inventories and cease generally in seeking new sources of scrap.

Again, it is expected that this situation will improve by the third quarter of 1982 when it is hoped that some of the inflationary pressures will have eased and when scrap traditionally starts to move again.

Both demand and price for municipal ferrous scrap (MFS) are affected by the over-all scrap situation. Currently, the MFS from the Experimental Resource Recovery Plant is being sold to LASCO, a mini steel mill despite the poor business conditions, although the price is depressed from the earlier high prices. Over the past two years the MFS prices have ranged from \$35 per ton to over \$60 for the shredded grade and to \$95 per ton for the processed and baled grade. If the economy recovers by late 1982 and should the movement of steel products improve, then we can expect the MFS prices to rise again to their previous levels.

Foundries such as General Motors, St. Catharines, have been a market for baled municipal ferrous scrap in convenient sizes (12" to 15" cubes) from the Experimental Plant for Resource Recovery. Prices have ranged from \$100 per ton to \$75 per ton for the baled material.

The foundry industry generally is slow and the General Motors Foundry Division in particular has drastically reduced its scrap buying and is currently adjusting to a depressed and changing automotive market.

The detinning industry (Hamilton), a primary outlet for clean Municipal Ferrous Scrap (can scrap), continues to buy from collectors at 40% of the Stelco #1 price. This market is expected to remain steady, since the company is able to handle all the available clean uncontaminated can scrap.

Background

Municipal solid waste (MSW) amounts to some 1.7-2.2 lbs. per capita per day and when combined with commercial waste to about 2.0-3.5 lbs. per capita per day.

Municipal solid waste is of great interest because it contains values in the way of potentially recoverable products.

This waste typically contains:

- 50% or more paper products
- 4-7% ferrous scrap (20-60% cans)
- 5-10% glass
- 2-5% plastics
- 1/2 to 1% non-ferrous (aluminum, brass, copper, etc.)
- Remainder is a mixture of inorganic and organics. Some of these organics can be identified and separated (textiles, wood). The organics are the compostible materials which at the Experimental Plant for Resource Recovery (ERRP), Downsview, are mechanically digested into a compost product.

The recycling industry is unique in that it competes on a national and world market on a free trade basis. The laws of supply and demand are very much in evidence as recovered materials are shipped across borders and oceans to satisfy demands.

The MSW resource base is renewable. The search for new technology to utilize recovered resources has been intensified in order to reduce the volume of solid waste for disposal and to produce useful products.

No one method is a final solution as resource recovery is a combination of high and low technologies encompassing both material and energy recovery.

High technology systems use mechanical and/or chemical processes to recover materials (paper, ferrous, glass, cardboard, compost, non-ferrous) or energy or both.

Source separation at the consumer level is a low technology system undertaken by curbside collections or depots. Consumers can easily separate newspapers, office papers, cardboard, glass containers and steel cans.

RECOVERED PRODUCTS AND MARKETS

I NEWSPAPERS

Waste newspapers should be recovered for recycling before they are discarded to the solid waste stream. Source separation at the consumer level or low technology systems are best utilized to recover waste newspapers. Mechanical separation of different grades of paper in a complex high technology resource recovery plant such as the Experimental Plant for Resource Recovery (ERRP) is not possible at present because of the contamination and the heterogeneous mixture of the waste.

Discarded newspapers represent 8 to 12% of the solid waste stream with an average generation in Ontario per capita per year of about 0.036 tons (0.20 lbs per day per person).

A total of approximately 350,000 tons of used newspapers is available in Ontario with a current recovery rate of 20% (75000 tons). This tonnage is recovered through the efforts of various recycling groups, municipal curbside collection systems and the network of waste paper dealers. Much higher rates (over 50%) have been achieved on a local level due to specific demands. To develop such higher rates on an overall and steady basis would require consistent market demands for waste paper.

The collection of waste newspapers has been subject to cyclic economic conditions which affect the traditional consumers of waste paper (paper and board mills) from time to time.

Traditional Markets - Newspapers

Prices for waste paper fluctuate as the forces of supply and demand work on these markets. Excessive regional demands for waste paper can run contrary to general poor economic conditions in other segments of the industry or country and thereby cause further havoc in the market place.

A case in point is the pending installation of a newspaper deinking mill by Ontario paper Co., Thorold, Ontario to produce newsprint; a step which has placed a demand on the supply of waste paper particularly when Ontario Paper announced that it would require some 50,000 tons per year by 1982 and 100,000 tons per year by 1984.

Because of the deinking mill start-up delay of several months, a temporary situation has developed whereby Ontario Paper Co. has had to curtail its buying of waste newspapers. This is due to an excessive inventory build-up resulting from their earlier aggressive efforts to establish sources, collection systems and dealers to recover waste newspapers.

With a decline in demand many collectors now are faced with the all too familiar dilemma of what to do with the collected paper when their local buyers (e.g. paper dealers) are unwilling to purchase waste news at a price high enough to offset collection costs. Many collectors turned directly to Ontario Paper Co. as a last resort outlet for their waste paper believing that since the company was the ultimate user, it would purchase

the collected paper regardless. However, in this case, Ontario Paper Co. had accumulated a very large inventory which at least temporarily restricts its purchasing of additional waste paper.

In the past we have seen the curtailment of collection systems because of a temporary fall in demand. Such action has made it difficult to restart similar collection efforts when the demand increased. On again, off again collection trends are not compatible with a substantial increase in waste paper use, such as the needs of a waste newspaper deinking plant.

Until the new deinking mill came on the scene to manufacture newsprint from waste newspapers, there never has been a steady demand within the traditional users of waste paper.

The Waste Management Branch of the Ministry of Environment had recognized this and took steps to develop and encourage alternative uses for waste paper.

Alternative Markets

Cellulose Insulation

Waste newspapers have been used for some time in producing a cellulose fibre insulation product for residential use. The upsurge in usage came in the years 1976-78 when the Federal government CHIP programme was instituted. This grant programme encouraged residents to up-grade their home insulation. The programme is presently applicable to homes built before 1961.

Waste Management Branch staff of the Ministry of Environment have actively participated in this market development, and were represented for several years on the founding committee of the Canadian Standards Specification Board (CSSB) for the establishment of standards for cellulose insulation.

Consumption of paper in this market in Ontario rose to about 80000 tons per year by 1977-78 but has since decreased to approximately 10,000 tons per year. The industry has had regulatory problems all of which have now been resolved. In the meantime, increased production and advertising from the competitive fibre glass and mineral wool producers has exerted pressure on the cellulose manufacturers. This, along with a drastic reduction in new housing starts, has reduced the insulation market and put much pressure on the cellulose suppliers. Cellulose insulation in the long term may only maintain a 10-15% share in the insulation market amounting to some 25,000 tons per year. Cellulose insulation usage may expand beyond the normal attic insulation upgrading if new uses are developed in the residential and industrial areas.

Cattle Bedding

Interest has been developed within the agricultural community in the use of shredded waste newspapers as a substitute for straw animal bedding.

Several years ago, the Waste Management Branch of the Ministry of Environment recognized this potential use of shredded newspapers as an

animal bedding. After a literature survey, it was concluded that little factual data existed on the possible health problems from cattle eating the newsprint bedding which might contain dangerous residual amounts of trace metals. Because of this, the Waste Management Branch contracted a study at the University of Guelph to study the voluntary up-take of newsprint bedding by cattle under various conditions.

This study concluded in August, 1981, and in essence indicated that the up-take of bedding as part of the cattle's feed was not significant and that residual trace metals were low. Based on this, it is now felt that market development for animal newspaper bedding can go ahead unrestricted.

Farmers who have used newspaper bedding and there are several Ontario sources for this product, report the bedding has superior absorbent properties to straw and that it could be price competitive. Straw availability and price fluctuate from year to year according to crops grown and the weather.

Total Canadian bedding usage has been estimated at 2.5 million tons per year. We estimate the Ontario consumption between 400,000 and 450,000 tons per year. About 15 lbs of bedding per week per animal is an average usage. A reasonable 5% replacement of straw with paper would in Ontario create a market of some 20,000 tons per year.

An aggressive programme of marketing can be established by combining the efforts of several key producers and distributors in selected areas of rural Ontario.

Incineration of Sewage Sludge

The addition of pulped newspapers and polymers to sewage sludge in lieu of ferric chloride and lime can result in significant fuel savings during sludge incineration.

The London Greenway Pollution Control Plant (9000 tons dry sludge per year) converted their treatment system to facilitate the use of pulped newspapers. A 50% saving was reported in the use of natural gas necessary to incinerate the sludge. An average of 8 to 18% addition of waste papers on a dry sludge basis is used at London, to account for about 45 tons of newspapers per week.

The potential demand per year for waste newspapers from existing municipal sludge incineration based on a 15% addition is about 14000 tons. London, Hamilton and Toronto are the only cities with sludge incinerators with a total capacity of 70,000 tons of dry solids per year. The new Duffins Creek Plant of the Municipality of Durham at this time is an unknown factor as far as using pulped waste newspapers as an aid for dewatering. Little growth can be expected beyond 15,000 tons per year of waste newspapers in this application.

Prices and Future Trends

Waste newspapers like other recyclable secondary products, have been subject to the cyclic economic conditions that have prevailed over the years.

Prices fluctuated within a \$15 per ton range from 1965 to mid 1973 after which they rose rapidly to mid 1974 and then plunged to lows of \$5 to \$10 per ton through 1975. During 1976 and most of 1977 prices rose to the \$40 to \$45 per ton range until late 1977 and early 1978. Then a dramatic increase took place, in some cases a price of over \$100 per ton was reached. Late in 1978 and through 1979, prices plunged again to the \$40 to \$45 per ton range and rose in early 1980 to \$60 to \$80 per ton range. It is now down again to the \$5 to \$25 per ton.

Expansions and regional activities of the paper and board mills have accounted for the fluctuating demand-price structure. Long term outlook on the use of secondary fibre by these mills, however, is positive based on a potential decrease in virgin fibre. Export markets when they are active will also be a factor.

The North American cellulose market encouraged by the energy crisis with subsequent governmental financial aid to consumers to upgrade home insulation also put pressure on waste paper supplies in the 1977 and 1979 periods. Although this pressure has not been sustained, renewed activity on the part of cellulose insulation manufacturers could be expected should the Federal Government extend its "CHIP" grant for up-grading home insulation, to homes built after 1961.

The onset of a deinking plant in Ontario early in 1982 should stabilize the demand for waste newspapers. The price should again be in the \$60 to \$75 per ton range at the mill. Alternative markets as discussed previously will eventually be a positive factor.

All these above factors should have a positive effect on demand of waste newspapers. This may be long term, however, since a turnaround in the economy is not expected now until late 1982, at the earliest.

II Ferrous Scrap

Ferrous metal recovered from the solid waste stream should be referred to as "Municipal Ferrous Scrap" (MFS) although quite often it is simply called "tin can scrap". This fraction represents 4-7% of the solid waste and can be recovered by magnetic separation in a processing plant or to some degree by source separation. Potential ferrous in municipal solid waste in Ontario amounts to about 300,000 tons per year. On a 30% recovery rate through source separation about 60,000 tons (cans only) might be recovered. A mechanical resource recovery system, e.g. Experimental Resource Recovery Plant, Downsview, currently recovers 10-15 tons per day from the processing of 220 tons per day of waste. Collection systems would have to be viewed on a long term basis to reach the above levels of recovery although a resource recovery plant offers the best way of recovering ferrous.

Specific markets for this recyclable material depends upon the degree of processing it receives after being separated and collected. Although the material should always be free from organic contaminants when

separated, some potential end-users also require the material to be further processed mechanically into a denser form by baling or shredding.

The ferrous product from the Experimental Plant for Resource Recovery typically has a bulk density of 25-30 lbs per cu ft. This product is a mixture of food and beverage cans (40 to 60%) and miscellaneous light ferrous scrap. In this form, the ferrous is suitable for use in mini steel mills, detinning operations, and some foundries.

Source separated ferrous invariably consists of all beverage and food cans. This product has a low bulk density (5 to 15 lbs per cu ft). Increasing the density mechanically can be justified only to realize lower haulage costs. This benefit obviously must offset the processing costs.

Quality Considerations

The separated material must meet the end-user's requirements or specifications which means control over density, chemistry, cleanliness, shape and size. In many instances, industry maintains its own material specifications which governs the value and acceptability of the material. Because of these requirements, some markets are precluded from small at-source collectors of ferrous. These collectors have neither the tonnage nor the money to undertake extensive processing to meet the specifications as well as to minimize their shipping costs.

Collectors pay shipping costs so that users located over about 50 miles from the source with tonnages per shipment of under 20,000 lbs would be beyond economical range. The costs escalate rapidly for any load under the minimum of 20,000 lbs.

By centralizing small collectors through large scrap dealers or a resource recovery plant, tonnages can be maximized to justify the higher processing costs.

Typically, a 40 cu. yd. bin would contain about 13 tons of shredded ferrous material from the Experimental Plant for Resource Recovery or about 3-8 tons of unprocessed cans from a source separation operation.

Source separation at a typical 30% recovery participation rate in a 30,000 community would yield a minimum shipping load of 20,000 lbs of flattened cans in about 3 weeks.

Traditional Markets - Ferrous

The traditional markets for municipal ferrous scrap are as follows.

1) De-Tinning

The primary market for source separated ferrous cans has always been the detinning industry (Metals Recovery Inc., Hamilton, Ontario). Metals Recovery now pay 40% of the Stelco #1 bundle buying price, although no doubt for large consistent tonnages a firm price may be negotiable. There are some restrictions, however; the material should be free of aluminum ends (beverage cans) and of course contain a large portion of tin coated cans.

2) Mini-Mills

Mini or steel market mills which produce steel bar stock from 100% scrap steel raw materials will always represent a market for municipal ferrous scrap provided the scrap is processed properly to meet density requirements. Again, this precludes the small collector unless a centralized facility can process sufficient tonnage.

3) Scrap Dealers

There will always be some scrap iron dealers who will provide an outlet for the recovered ferrous product although the price offered by them generally will be quite low when compared to average scrap prices. This situation may well change when this material is established as a credible alternative particularly with the tonnage steel plants such as Stelco and Dofasco in Hamilton.

4) Foundries

Although the viability of using municipal ferrous scrap in the foundry industry has been demonstrated with material from the Experimental Plant for Resource Recovery, Downsview, the industry requirements usually preclude the small collector from participating in this market.

5) Tonnage Steel Mills

The basic steel producers are located in Ontario; Stelco, Dofasco, Algoma Steel and Atlas Steels. They account for all the basic steel tonnage in Canada and generally consume over 3,000,000 tons of ferrous scrap per year. However, their requirements are quite stringent and are

based on metallurgy, size and density. We have discussed MFS with both Stelco and Dofasco and have made them aware of our market development efforts within both the foundries and mini-mill steel plants. It is expected that either one of these plants might soon be doing some extensive test work with baled ferrous from the Experimental Plant for Resource Recovery. This type of market is precluded from the small collector since the material must be processed and should be in sufficient tonnage as well as meet specifications.

6) Copper Extraction

Extracting copper from solution by the use of ferrous scrap in a leaching solution is one accepted method of recovering copper. The only producer in Canada is Gaspé Copper Mines, Murdochville, Quebec. Their requirements for this type of scrap are quite stringent. The material must be clean, tin free, 11 gauge, under 4 inches. Consumption is about 2 1/2 lbs of iron units for each pound of copper. At Gaspé, this would amount to 1300 tons of iron units per month. Municipal ferrous scrap in Ontario recovered either by source separation or by the Experimental Plant for Resource Recovery would not meet the specifications for this application and currently could not be used.

7) Ferro-Alloy Industry

The ferro-alloy smelting industry no longer has a base in Ontario but is now centered in Quebec. Ferro-silicon alloys are produced from steel scrap and other materials. Shredded municipal ferrous scrap can be used

in this application but is not applicable to Ontario sources of municipal ferrous scrap because of the distance and the limited tonnage requirements of that industry.

The preceding discussion on specific markets for municipal ferrous scrap are outlined in the attached Table I.

Prices and Future Trends

Local prices for ferrous scrap fluctuate but invariably are affected in some way by the North American trading patterns for scrap metals as well as the export market for the material.

Demand for the scrap from Third World countries in the Far East can cause upsurges in export trade putting severe pressure on prices.

Prices generally are quoted monthly as brokers and dealers buy and sell tonnages of scrap. Large generating areas of scrap such as the automotive companies place scrap on auction while traders bid for the material.

However, the trend of the Ontario prices usually is set by Stelco which, if in the market place, sets the price for its #1 heavy grade of scrap steel. Scrap dealers act accordingly and trade for the highest dollar value although there are many fixed buyer-seller relationships.

The Experimental Plant for Resource Recovery, Downsview, for instance, sells most of its shredded municipal ferrous scrap to LASCO, a mini-market mill which follows bases its buying price on the Stelco #1 price albeit at a lower range.

According to published figures (American Metal Market), Stelco #1 price in this period averaged in 1971 about \$90 per ton, in 1980 about \$82 per ton and in 1981 to date about \$90 per ton.

The detinning industry uses a factor of the published #1 Stelco price when buying municipal ferrous scrap and this is usually 40%. The detinning industry is going through a period of adjustment. The long term outlook on the use of MFS as a source of detinning stock appears to be diminishing due to an apparent long term decrease in the use of tin in both beverage and food cans.

Although the economy is in a recessionary period, prices have not dropped that drastically but rather the ferrous scrap material has not been moving, leaving the dealers with high inventory costs and low cash flow.

Generally, the scrap user controls the situation since it is their decision to buy which eventually determines the market and time. Stelco has only recently come back from a lengthy strike and at this stage it is too early to determine what effect this will have on the market place. In

the meantime, mini-mills like LASCO whose recent activity had been buoyed by the Stelco strike are now cutting back on operation. The low activity in the construction trade is also affecting their business.

Significant improvements in the ferrous prices probably will not appear until the third quarter of 1982 when it is hoped that some of the recessionary factors will start to ease.

PJP/gr
26/01/82
MT 01 01

TABLE I - FERROUS MARKETS
December, 1981

INDUSTRY	LOCATION	REQUIREMENTS	RESTRAINTS	PRICE RANGE & COMMENTS USER SITE
Detinning	1 plant in Canada Metals Recovery Inc. 670 Stratherne Ave. N. Hamilton Ont. 549-9894	Clean, shredded or flattened. Free of aluminum ends. Minimum 0.15% tin content.	Bi-metal beverage cans with aluminum ends. Dirty & extremely dense product.	MRI now pay 40% of Stelco #1 grade - about \$36/ton. Open to negotiation but depends on grade, amount & consistency.
Scrap Dealers	Many operators. Contact Canadian Assoc. of Recycling Industries 67 Yonge St., Suite 1003 Toronto, Ont. 362-4521	Large dealers have facilities to process. Should be clean. Dealer may broker if source shreds or bales.	Dirty scrap. Dealers view tin content as severe constraint.	No fixed prices. Scrap dealers react to monthly Stelco buying price for #1 grade scrap. Must negotiate prices. Could be \$5/ton to \$50/ton.
Market Steel Mills	LASCO - Whitby, Ont. Burlington Steel -Hamilton Courtice Steel - Cambridge, Ont.	Clean, shredded or baled. Electric furnace use only.	Dirty, low density if not shredded	Generally governed by monthly Stelco buying price for #1 grade scrap. Currently ranges from \$30 to \$75 per ton for municipal ferrous scrap.
Iron Foundries	60 within Golden Horseshoe	Baled (12" size).	Lack of density if not baled. Shredded, not dense enough. Some metallurgical constraints. Require either electric furnaces or large cupola furnaces.	Price governed by Foundry Grade Steel Scrap Prices. Could be \$60 to \$100/ton.

TABLE I (cont'd)

INDUSTRY	LOCATION	REQUIREMENTS	RESTRAINTS	PRICE RANGE & COMMENTS USER SITE
Tonnage Steel Plants	Stelco - Hamilton Algoma Steel -SSM Dofasco - Hamilton Atlas Steels - Welland	Baled or shredded.	Tin content viewed as a constraint.	Would probably purchase as "turning or light bushling scrap" or as a grade bet- ween #1 & #2 bundles. Could be from \$30 to \$75 per ton.
Copper Industry	One in Canada- Gaspé Copper Mines - Murdochville, Que.	Tin free, clean 11 gauge scrap - 4" size.	Tin content residual alloys or other. Must be clean.	Currently US source sells Gaspé Copper. Price could be from \$75 to \$90 per ton.
Ferro-Alloy	Quebec only.	Shredded, clean incinerated material can be used.	Dirty, low bulk density.	Negotiable.

TD
794.5
P86
1982